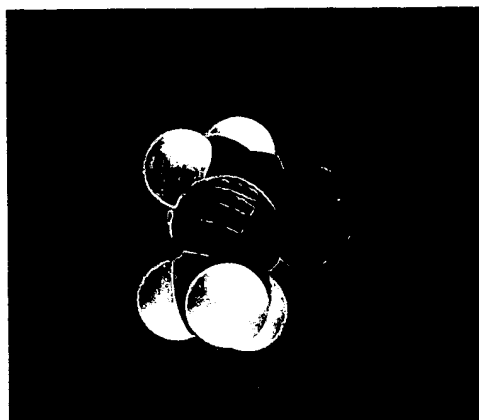


## **APPENDIX I**

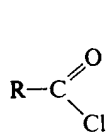


## Functional Derivatives of Carboxylic Acids

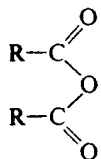
### *Nucleophilic Acyl Substitution*

#### 20.1 Structure

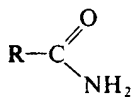
Closely related to the carboxylic acids and to each other are a number of chemical families known as **functional derivatives of carboxylic acids**: *acid chlorides*, *anhydrides*, *amides*, and *esters*. These derivatives are compounds in which the  $\text{—OH}$  of a carboxyl group has been replaced by  $\text{—Cl}$ ,  $\text{—OOCR}$ ,  $\text{—NH}_2$ , or  $\text{—OR'}$ .



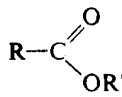
Acid chloride



Anhydride



Amide



Ester

R may be  
alkyl or  
aryl

They all contain the **acyl group**,  $\text{R}-\text{C} \begin{array}{l} \text{O} \\ \parallel \end{array}$

Like the acid to which it is related, an acid derivative may be aliphatic or aromatic, substituted or unsubstituted; whatever the structure of the rest of the molecule, the properties of the functional group remain essentially the same.